National Cave and Karst Research Institute

2003 Annual Report

● Science ● Information Management ● Education ● Resource Management

LEGISLATIVE PURPOSES

THE NATIONAL CAVE AND KARST RESEARCH INSTITUTE ACT OF 1998

When Congress established the National Cave and Karst Research Institute (the Institute) in January 1998, it provided the cave and karst community with an unprecedented opportunity to further research, education, information transfer, and resource management revolving around these important, but fragile, landscapes. The Institute's legislation offers the opportunity to develop a unique style of national effort with a broad base of both federal and non-federal support extending from collaborative projects to shared administrative responsibilities to matching funds.

Congress passed the National Cave and Karst Research Institute Act of 1998. In the Act, Congress stated that the purposes of the Institute are:

1. to further the science of speleology;
2. to centralize and standardize speleological information;
3. to foster interdisciplinary cooperation in cave and karst research programs;
4. to promote public education;
5. to promote national and international cooperation in protecting the environment for the benefit of cave and karst landforms; and
6. to promote and develop environmentally sound and sustainable resource management practices.

NPS D-1524, March 2004

TABLE OF CONTENTS

Cover photographs are used with permission of the photographers:
John C. Woods (main photograph) and Kenneth Ingham (inset photograph).

Photo: John Woods

Louise D. Hose, PhD
Director

NATIONAL CAVE AND KARST RESEARCH INSTITUTE

NCKRI

Letter from the Institute Director

In December 2002, I accepted the greatest privilege of my life when I was selected to lead the National Park Service's effort to launch the National Cave and Karst Research Institute (NCKRI) in Carlsbad. Encouraged and gratified by the diversity and depth of support, I have seen the Institute rapidly grow and evolve over the past year. Our progress resulted from the efforts of traditional NCKRI supporters and a rapidly expanding range of stakeholders who connected with the Institute during the past 12 months. Cave and karst specialists from around the world have expressed strong interest and support for our mission by encouraging us to provide leadership worldwide in promoting the understanding and protection of cave and karst systems. The community of cave and karst researchers, educators, conservationists, managers, and cavers from Australia to Ukraine has demonstrated its recognition of the need for a strong, multidisciplinary, research and education center focused on the world's fragile and vulnerable cave and karst terrains by enthusiastically following and advising our efforts to craft the Institute into the most effective organization possible.

THE ROLE OF THE NATIONAL CAVE AND KARST RESEARCH INSTITUTE

Karst and other cave-bearing terrains make up over 20% of the United States and the continents worldwide. These landscapes present unique challenges to urban and economic development. Karst aquifers rank as the most vulnerable groundwater to rapid and devastating contamination. While urban development has largely shunned karst lands in the past, some of the nation's fastest growing areas are now expanding into these terrains. State and local governments such as Florida and San Antonio understand this problem and now commit millions of dollars each year to study, monitor, and remediate contaminated karst water resources.

NCKRI has a broad mission…"to promote understanding and protection of cave and karst systems."

The challenges for cave and karst land owners and managers grow as populations encroach on previously isolated areas. The intentional vandalism to caves in Sequoia National Park in fall 2003 and continuing concerns with inadvertent hydrocarbon contamination of cave streams under Bowling Green, Kentucky, show the need for more effective education and preservation efforts directed toward the general public. Many individuals and organizations from across the country and around the world are addressing these issues, but they require sustained and growing support in their efforts. The Institute recognizes this need and places a high priority on supporting and facilitating cave and karst related research and educational efforts.

FISCAL CHALLENGES

One of the National Cave and Karst Research Institute's biggest challenges promises to be securing funding from both federal and non-federal sources. Our legislative mandate limits the potential federal contribution to 50%, requiring at least half of both operating and capital funding to come from non-federal sources. The Institute enjoys comfortable "seed" funds, thanks largely to the efforts of the people of Carlsbad, New Mexico, and their representatives. Our current, baseline funding is approximately $700,000/year and the State of New Mexico has provided a little over 50% of the Institute's operational funds. New Mexico and the City of Carlsbad also account for 55% of the $4.3 million obligated for the design and construction of a headquarters building. NCKRI's three primary partners, the National Park Service, New Mexico Institute of Mining and Technology, and the City of Carlsbad, are working closely together on the design of the two-story, approximately 24,000 square foot building near the Pecos River next to downtown Carlsbad. While we will require more funds to outfit the building and effectively operate activities as envisioned, these seed funds have facilitated a rapid and strong start towards establishing the Institute. Our present budget adequately covers today's limited operations; however, we will seek to expand our financial support in order to meet the many challenges that our partners and stakeholders expect the Institute to address.

Participants attending the Vision Building Workshop suggested the following core values for NCKRI:

Science-Based Stewardship

Objective Science

Education

Shared Decision-Making

Benefits for all Segments of Society

Leadership

Passage lined with aragonite and calcite crystals.

BUILDING THE INSTITUTE'S VISION

The National Cave and Karst Research Institute has a broad mission, summarized as existing "to promote understanding and protection of cave and karst systems" by a group of distinguished representatives from over 20 major stakeholder organizations participating in our Vision Building Workshop in October 2003. This group of scientists, educators, land managers, and leaders from government agencies, educational institutes, and non-profit organizations came together for two days in Shepherdstown, West Virginia, to consider both the scope of activities that NCKRI should pursue and how to build the organizational structure to best support those activities. The enthusiasm and passion that participants brought to the discussions bode extremely well for the future of the Institute and the mutually beneficial partnerships that we can expect to develop.

The participants promoted a broad variety of needs that might be addressed by NCKRI and came to a general agreement on the Institute's scope and the best type of organizational characteristics to meet these needs. A summary of the meeting is available at **http:/www2.nature.nps.gov/nckri/news.htm.**

We hope to release a business plan in 2004 that will reflect and build on this and other valuable input we received over the last year.

PARTNERSHIPS

In 2003, NCKRI made great strides in continuing to build partnerships and expand beyond federal government circles. Several partnership projects initiated in the previous 18 months began to produce results, including the publication of three books and the continuing growth of the National Karst Map Project. Our staff responded to a variety of agencies, non-government organizations, individuals, and the media when they sought assistance on cave and karst related projects. NCKRI staff and associated faculty have also produced an impressive publication and professional service record in just one year that is documented in the back of this report. The Institute moved towards fulfilling its legislative mandate to be jointly administered with the National Park Service exercising "indirect control," by signing of a Memorandum of Understanding between the National Park Service, New Mexico Institute of Mining and Technology, and the City of Carlsbad establishing a triad partnership. We look forward to expanding our network of formal partnerships with other governmental and non-governmental organizations across the country and internationally in the future.

LOOKING TOWARDS OUR FUTURE

The National Cave and Karst Research Institute enjoys a strong and varied base of partners to address the critical need of protecting vital natural resources. In addition to our nation's cherished Park and other federal lands, the Institute will be available to work with cave and karst programs throughout the world. We look to develop mutually supportive partnerships with all organizations and individuals striving towards better understanding and management of karst, including private industry and non-profit, academic, and government groups. The Institute seeks to serve as a respected world leader in promoting science-based understanding and sustainable stewardship of caves and karst lands. As you read the following pages, I invite you to think about how you or your organization might join NCKRI in crafting the strongest and most effective coalition possible to support cave and karst education and research worldwide.

www2.nature.nps.gov/nckri
nckri-mail@cemrc.org
lhose@cemrc.org

Louise D. Hose

Louise D. Hose, PhD
Director

YEAR IN A GLANCE

SUMMARY OF 2003 MILESTONES

JANUARY, FEBRUARY, MARCH

The City of Carlsbad (City) and The New Mexico Institute of Mining and Technology (New Mexico Tech) and the National Park Service (NPS) signed a Memorandum of Understanding that provides coordination between the three entities to facilitate the development and management of the National Cave and Karst Research Institute.

The National Park Service budget signed by the President earmarked $2 million for the Institute building construction in Carlsbad.

Director Hose met with National Park Service Water Resources Division in reference to the proposed building site for NCKRI.

An additional $350,000 was appropriated in next year's New Mexico state (FY03-04) budget for the NCKRI building.

The Federal Working Group met for three days at Mammoth Cave National Park, Kentucky, to discuss the Institute's continuing development and heard numerous presentations on cave and karst programs in Kentucky.

Mammoth Cave National Park Superintendent Ron Switzer speaks to the Federal Working Group.

APRIL, MAY, JUNE

The director continued contacting U.S. academic institutes and other groups with cave and karst programs to explore how the Institute might work with them. Individual discussions and correspondences took place with representatives from a score of colleges and universities, the Cave Research Foundation, the National Speleological Society, Edwards Aquifer Authority, Environmental Systems Research Institute, Los Alamos and Sandia National Laboratories, and the New Mexico State Lands Office.

Interim director Zelda Bailey completed the transition of NCKRI management to the permanent director and moved to a challenging new position as Director of the National Institute of Standards and Technology Boulder Laboratories.

Representatives from the City of Carlsbad, NPS, and New Mexico Tech interviewed three potential architectural design and engineering firms. The group decided to recommend that a joint venture team of Studio D Architects (Las Cruces, New Mexico) and Beryl Durham and Associates (Carlsbad, New Mexico) be invited to prepare a bid for work on the Institute's headquarters. This recommendation was accepted by the Carlsbad City Council, which ultimately hired the building designers.

English speleologist John Gunn and Western Kentucky University researcher Alan Glennon examine karst feature on UIS field trip in June.

The Department of Geosciences, Mississippi State University initiated a project to develop a digital karst map of Mississippi and digital maps of the karst features and the karst drainage basins that will provide a valuable contribution towards the National Karst Map, which is also sponsored by the Institute.

NPS Geologic Resources Division Chief Dave Shaver, affiliate scientist Penelope Boston, and Director Louise Hose attended the International Conference on Karst Hydrogeology and Ecosystems at Western Kentucky University (WKU) and discussed the Institute and its relationship with WKU, the Karst Waters Institute, Mammoth Cave National Park staff, and other members of the cave/karst community. Institute staff helped organize and host a post-meeting field trip in southeastern New Mexico.

WKU-NCKRI-USI field trip participants discuss gypsum karst feature near Carlsbad.

JULY, AUGUST, SEPTEMBER

The director sent a letter to the superintendents of National Parks with notable cave and karst resources and to 100 representatives of diverse U.S. cave and karst programs (governmental, academic, and non-profit) requesting input and suggestions concerning future Institute operations and administration.

Faculty from New Mexico Tech and four other colleges and universities submitted a grant pre-proposal to the National Science Foundation (NSF) targeted to provide major funding toward the Institute.

The City finalized design issues for The Cascades, the urban redevelopment site where the Institute will be built.

Director Hose, Penny Boston and five scientists/cavers worked extensively this quarter with the Japanese Broadcasting Corporation (NHK) on a high-definition television documentary on active sulfur speleogenesis in Cueva de Villa Luz, Mexico. Field assistance included 16 days by Louise Hose, eight days by Penny Boston, and a total of 30 days by Institute volunteers during September. NHK paid salary and all expenses for the Institute-provided assistance on this project.

During the summer, Institute-affiliated scientists Lewis Land, Penny Boston, and Louise Hose participated in a scientific assessment of Snowy River Passage, a stunning new passage of Fort Stanton Cave, central New Mexico.

New Mexico Tech began the formal search for the Chief Scientist position at NCKRI. This one-year, renewable contract position through a primary NCKRI partner provides additional flexibility during the establishment phase.

OCTOBER, NOVEMBER, DECEMBER

The Institute held a facilitator-run, two-day meeting with a small, but diverse group of cave/karst program representatives on October 5th and 6th in Shepherdstown, West Virginia, to discuss the Institute's operational and administrative vision.

Director Hose met with City of Carlsbad representatives and NCKRI building architects for an unveiling of the preliminary building plans for the Institute.

Lewis Land led a field trip for New Mexico Bureau of Geology's 2003 Decision Makers Field Conference *Water Resources of the Lower Pecos Region*. Over 50 individuals attended the conference, including a number of New Mexico state legislators and representatives from several state government agencies and federal legislative offices. The conference focused extensively on water resources in the karstic San Andres aquifer in the Roswell Artesian Basin. Several field stops provided opportunities for discussion of the essential role of karst phenomena in storage and transport of groundwater in the Artesian Aquifer.

The Institute distributed copies of *Recommendations and Guidelines for Managing Caves on Protected Lands*, a joint publication with the Karst Waters Institute, to National Park Service, U.S. Forest Service, Bureau of Land Management, and U.S. Fish and Wildlife Service cave and karst programs for use by their management personnel.

NCKRI and New Mexico Tech's Cave and Karst Program played a major role in the New Mexico Tech President's Report that is submitted annually to the New Mexico State Commission on Higher Education. This report reflects the first full year of the NCKRI-associated Cave and Karst Studies Program at the university. The Hydrology Research Group within which Cave and Karst Studies is housed, was once again ranked fourth in the nation by U.S. News and World Report.

Director Hose attended the Karst Waters Institute's *Interdisciplinary Workshop on Epikarst* where she had the opportunity to discuss NCKRI with dozens of the world's leading cave and karst researchers from Canada, France, Hungary, New Zealand, Slovenia, Ukraine, and across the United States. Hose also attended the National Cave and Karst Management Symposium in Gainesville, Florida, which the Institute co-sponsored. She took advantage of many opportunities to discuss the Institute and potential future partnerships with federal and non-federal cave and karst programs nationwide. Hose and Land attended the Geological Society of America meeting in Seattle, Washington. Members of the NPS Geologic Resources Division also attended and discussed the Institute with interested parties who visited their exhibit booth. The meeting provided an opportunity to discuss the Institute with colleagues from across the United States as well as Australia, Canada, France, and South Korea.

THE PRIMARY PARTNERS

Three primary partners who have signed a mutual Memorandum of Understanding and currently comprise the National Cave and Karst Research Institute:

National Park Service (NPS), City of Carlsbad, and New Mexico Institute of Mining and Technology (New Mexico Tech).

The NPS has the leading role in establishing the Institute and provides nearly half of the funding and most of the current staff support. The NPS also offers internationally recognized expertise in cave and karst stewardship policies and needs. The City of Carlsbad has provided advocacy and secured funding for NCKRI. The City is responsible for managing the design and construction of the Institute's headquarters building in consultation with the other primary partners. New Mexico Tech supplies the academic and research foundation for NCKRI. The State of New Mexico contributes NCKRI operating funds through New Mexico Tech. Currently, New Mexico Tech provides one full-time staff position to the Institute and will fill a second full-time position (Visiting Chief Scientist) in Spring 2004.

NATIONAL PARK SERVICE, GEOLOGIC RESOURCES DIVISION

The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.
FROM THE NATIONAL PARK SERVICE MISSION STATEMENT

The National Park Service is working through the National Cave and Karst Research Institute to build a broad coalition of partners who will help promote the National Park Service's mission by enhancing the understanding and conservation of karst terrains and ecosystems throughout the world. The Institute will assist science-based stewardship in national parks and elsewhere. The National Park Service welcomes this exceptional opportunity to work with other cave and karst researchers, educators, and land managers to improve and expand Best Management Practices.

Congress tasked the National Park Service with establishing NCKRI and the responsibility for this effort fell upon the Geologic Resources Division. The Division enthusiastically embraced the responsibility, in large part because of the support and attention given by Division's National Cave Program Coordinator Ron Kerbo. In 2000, the Division recruited an administrator, Zelda Chapman Bailey, with experience in program development and partnerships as the two-year interim director and began the process of developing the incipient institution.

In 2003, with the groundwork completed, the National Park Service began to work on Institute staffing, the design and construction of a headquarters building, and identifying a partner to manage the day-to-day operation. The hiring of Louise Hose as the Institute's first permanent director, marked the organization's transition from its Initial Development Phase based in Denver, Colorado, to the current Gearing-Up Phase based in Carlsbad, New Mexico.

In February, the NPS signed a MOU with New Mexico Institute of Mining and Technology and the City of Carlsbad that provides coordination between the three entities to facilitate the development and management of the National Cave and Karst Research Institute. The MOU established the basis for cooperation among the parties.

Also in 2003, nearly $2 million in federal funding for the NCKRI Headquarters building came through NPS appropriations. The NPS now provides an annual

operating base of approximately $350,000 (matching the New Mexico annual funding) within the Geologic Resources Division budget. The Geologic Resources Division supports the Institute with staff and other resources. During the past year Division Chief Dave Shaver, along with specialists Ed Kassman and Ron Kerbo, worked closely with the Institute staff to attract partners, hire staff, provide technical assistance and "grow" the organization. The Division's Washington Liaison, Lindsay McClelland, assists with the Institute's needs and interactions with D.C.-based offices and programs. Division staff is also working to complete the process necessary to transfer federal construction funds to the City of Carlsbad. The City will build and own the facility and Institute staff will work there under a long-term lease.

Establishment of the Institute furthers the mission of the National Park Service to preserve and protect the resources of the national park system, using the best available scientific knowledge, for the benefit of future generations. However, the Institute's legislative charter also directs it to move beyond the realm of a federal agency and to connect with academic, scientific, and educational resources in a way not previously attempted by the National Park Service.

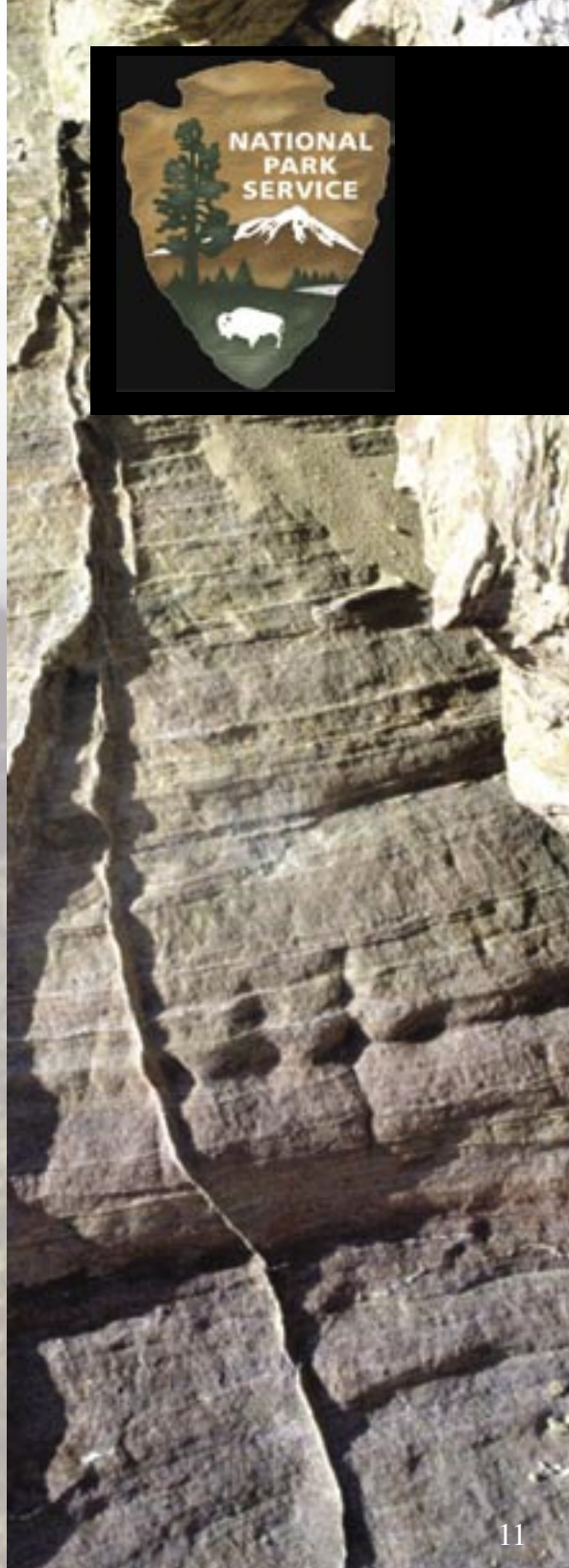
The October Vision Building Workshop in Shepherdstown, West Virginia, reflected the latitude and broad public-private partnership contemplated by the Act. Geologic Resources Division staff worked closely with our primary partner, New Mexico Tech, developing the invitation list and soliciting participants, and preparing the agenda, materials, and goals for the workshop. The workshop effort was praised by the over 20 diverse stakeholders who participated and provided input to both organizations about the vision they hold for the Institute.

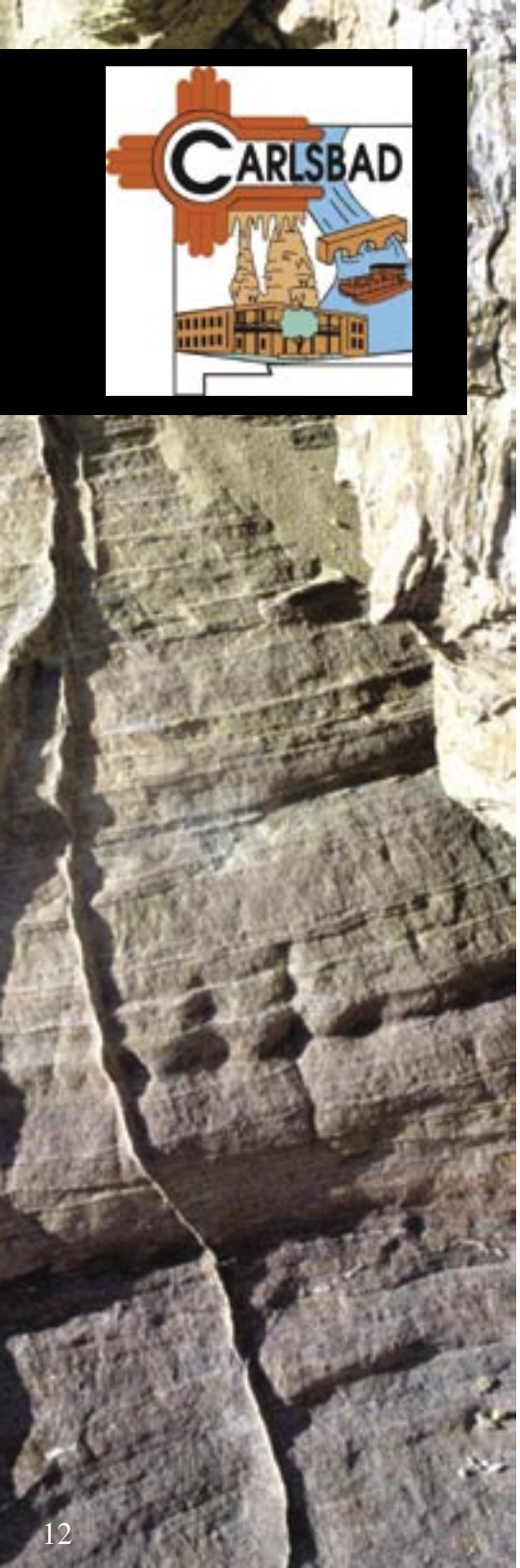
The Gearing-Up Phase is expected to last several years. During that time, the NPS will continue to shepherd the Institute as it continues to grow and evolve. A major goal for this phase will be formalizing an arrangement with the primary partner, New Mexico Tech, that will develop and carry out many of the NCKRI's activities. Division staff will continue to oversee the Institute and staff from the parks with major cave resources will work with it on issues regarding resource management, research, and education. Once the day-to-day management responsibilities are transferred to an administrative partner, the NPS role will shift towards oversight, allowing the Institute the independence it needs to effectively carry out its mission. Until that partner comes on board, the NPS remains the sole administrator of NCKRI in consultation with the other primary partners.

Dave Shaver, Chief of Geologic Resources Division
National Park Service

NPS GEOLOGIC RESOURCES DIVISION STAFF CURRENTLY WORKING WITH THE INSTITUTE:

TITLE	NAME
Carlsbad, New Mexico	
Director, National Cave and Karst Institute	Louise Hose
Administrative Support	Roger Scott
Denver, Colorado	
Division Chief - NPS Lead	Dave Shaver
Cave Resource Specialist	Ron Kerbo
Policy/Regs. Specialist	Ed Kassman
Program Analyst	Diana Diedrichs
Secretary	Lindy Allen
Washington, D.C.	
Division Washington, D.C., Liaison	Lindsay McClelland





THE CITY OF CARSBAD, NEW MEXICO

The City of Carlsbad helped lead the efforts to pass the National Cave and Karst Research Institute Act of 1998 and to establish the first, and to date most significant, non-federal funding. We have been involved with the Institute since its beginning and remain committed to help move NCKRI ahead as the leader in cave and karst research and education. We recognize from our experiences with several other national research centers sited in Carlsbad (i.e., Los Alamos National Laboratory, Sandia National Laboratory, Carlsbad Environmental Monitoring and Research Center) the positive benefits to our community that will come from engaging as full partners in NCKRI.

Carlsbad has a long and proud tradition of working with the National Park Service (NPS) in promoting and protecting our two local national parks (Carlsbad Caverns and Guadalupe Mountains). In 1990, I, as mayor, appointed Chuck Wiggins as the first Chairman of the National Cave and Karst Research Institute Committee. Our partnership with the NPS towards establishing NCKRI began in 2000 when representatives of the City's Department of Development met with Interim Director Zelda Bailey and other NPS representatives. Carlsbad's mayor at the time, Gary Perkowski, and New Mexico State Representative John Heaton carried that interest further with a request for state funding. Subsequent efforts by Senator Jeff Bingaman's and the late Congressman Joe Skeen's offices, representatives of New Mexico Institute of Mining and Technology (New Mexico Tech) and New Mexico State University (NMSU) focused on office space, a proposed building site, funding, and partnerships.

Over the next two years, the dedicated efforts of the leaders of Carlsbad and the State of New Mexico paid off and the Institute became a reality. Temporarily housed on the campus of NMSU's Carlsbad Environmental Monitoring and Research Center, NCKRI began receiving funding from the State of New Mexico that included annual operational appropriations of $350,000 as well as $1.340M for the construction of a building. The City of Carlsbad also pledged nearly $1M of in-kind services toward the building.
The City of Carlsbad has been very involved with the funding, design, and construction of the NCKRI headquarters building and has focused on the Institute as another attraction to bring visitors and jobs to the area. We have provided major support towards legislatively establishing and funding the Institute and deeply care about its future.

In 2003, the City of Carlsbad continued strong support for NCKRI. We worked hand-in-hand with the NPS and New Mexico Tech in finalizing the location for the Institute's building and contracted with an architect and engineering firm to design and construct the building. The City has also pledged support for the development of a business plan for the Institute as well as legislation to secure long-term operating funds from the State of New Mexico.

The Institute building will anchor the City's major, riverfront redevelopment project, The Cascades, and is scheduled for construction on a parallel track. The initial phase of The Cascades has gone out to bid and city officials hope to begin construction on that commercial effort as well as the NCKRI headquarters by summer 2004.

As we start the new year of 2004, the City is working closely with the Institute Director and New Mexico Tech staff to review preliminary designs and subsequent revisions. The architects are focusing on Construction Documents, which should be completed by mid-2004.

The City of Carlsbad takes pride in its important role in establishing the National Cave and Karst Research Institute and we look forward to helping it grow into an internationally recognized center attracting researchers, educators, and visitors from around the world.

Bob Forrest, Mayor **City of Carlsbad**

CURRENT CITY OF CARLSBAD STAFF WORKING DIRECTLY WITH THE INSTITUTE:

TITLE	NAME
Mayor	Bob Forrest
City Administrator	Jon Tully

NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY

The New Mexico Institute of Mining and Technology (New Mexico Tech) worked hard in 2003 to assist in the development of the National Cave and Karst Research Institute (NCKRI) and in efforts to develop its own program in Cave and Karst Studies. The biggest challenge was to develop clear relationships between NCKRI and its academic partner and to establish methodologies for accomplishing joint tasks. The particular type of arrangement between NCKRI and New Mexico Tech had no precedent, thus all functions required creation *de novo*.

Two staff positions currently represent NCKRI activities at New Mexico Tech: Dr. Penelope Boston, professor in the Earth and Environmental Sciences Department in residence at New Mexico Tech, and Dr. Lewis Land, karst hydrologist for the New Mexico Bureau of Geology and Mineral Resources who is in residence at Carlsbad. At the end of December 2003, Ms. Rosemary Baca was hired as a part-time assistant in residence at New Mexico Tech to facilitate joint NCKRI and New Mexico Tech cave and karst related activities between the two institutions.

New Mexico Tech conducted the search for the new Chief Scientist position through the New Mexico Tech hiring process. The Chief Scientist will be in residence at Carlsbad. Interview candidates were identified and interviews scheduled for early 2004.

Teaching and Public Outreach Activities

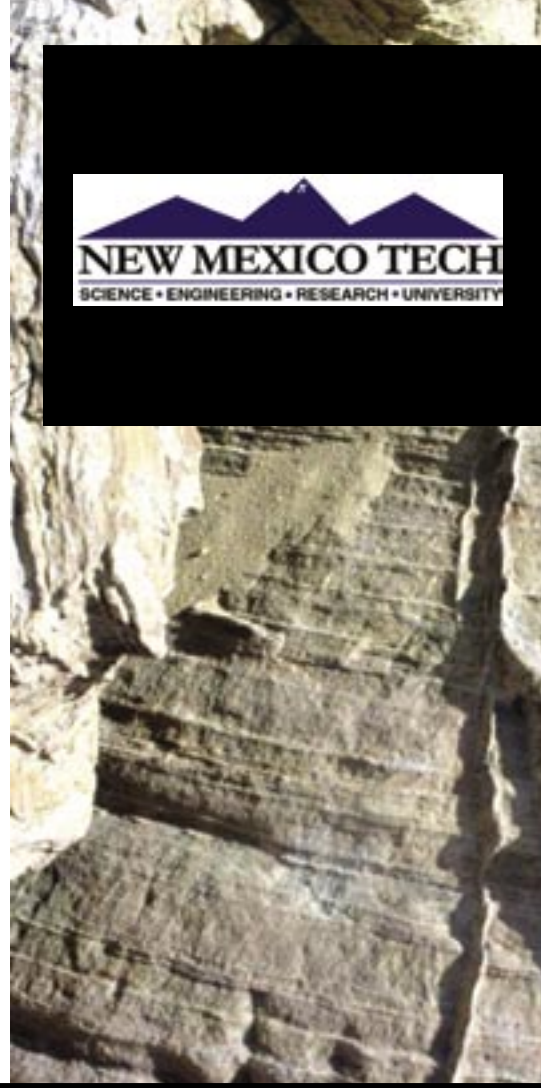
The first course offered at New Mexico Tech was Geol. 572 – Frontiers of Cave and Karst Science taught by Dr. Boston, Spring Semester 2003. Four undergraduate and three graduate students were enrolled. Excellent student feedback ratings were received for this maiden voyage of the course. The course culminated with a three-day field trip to Carlsbad Cavern and Spider Cave at Carlsbad Caverns National Park. In the spring semester of 2004, the course will be offered as Geol. 450/550 with an accompanying laboratory. Development of a meaningful laboratory and field experience in the many facets of speleology has been very challenging, but Dr. Boston looks forward to presenting this class for the first time beginning in January 2004.

Dr. Boston also worked on establishing a specific set of academic curricula in various aspects of speleology to serve as guides for prospective and incoming cave and karst students. These curricula are anticipated to be complete by the beginning of the fall 2004 semester and will be submitted for approval to the New Mexico Tech Faculty Council.

During 2003, New Mexico Tech received more than 30 inquiries from prospective students with cave and karst interests. Some were encouraged to apply to New Mexico Tech and some were put in contact with cave and karst scientists at other academic institutions. Two new PhD students were accepted for the New Mexico Tech fall 2004 program. Four other cave/karst and three karst hydrology applications are under review.

A number of graduate student activities are underway both at New Mexico Tech and other schools that are being supervised by New Mexico Tech Cave and Karst Studies. Additionally, Dr. Boston advises five undergraduate students, two of whom are bound for careers in cave and karst sciences. She also gave several guest lectures during 2003 in other classes (e.g., the basic Geol. 101 course, the Principles of Mineralogy course, and Landforms and Structures class). Dr. Lewis Land was guest lecturer for Boston's class on the use of geophysical tools for cave research and exploration. New Mexico Tech scientists advised in the development of a design course in the International Space University division to be offered at Pennsylvania State University during the spring 2004 semester. This project-oriented course will focus on designing science activities for exploration of caves on Mars and their eventual utilization as human habitat during future crewed space missions.

In September, Dr. Land gave a presentation to the geology department at the University of Texas-El Paso on the role of caves and karst processes in the hydrologic framework of southeastern New Mexico. During this visit, Dr. Land also



Students prepare to enter Wen Cave, N.M., on class field trip.

La Tetera science assessment trip to recently discovered cave in Arizona.

Lewis Land leads a field trip stop during the Decision Makers Field Conference.

MIT students investigate a lava tube.

participated in a radio interview on KTEP, the local public radio station in El Paso, and discussed several aspects of caves, karst research, and NCKRI with Dr. Keith Pannell, who conducted the interview.

K-12 Education

In 2003, a number of students of various ages have contacted New Mexico Tech for information and help with various school projects involving cave or karst issues. The university responded with information, links to websites, images, and project advice.

K-12 outreach activities continued in 2003 with mentoring of several Albuquerque area middle school student science projects for science fair entries. Dr. Boston made a special keynote presentation on cave and karst research for the New Mexico State Science Fair held at New Mexico Tech in April 2003. Dr. Boston also gave a guest lecture on cave science and exploration to the Summer Science Program, a nationally recognized competitive program for gifted high school juniors. This program has been housed in California for more than 40 years, adding New Mexico Tech for the first time in 2003 as a second site.

Dr. Land gave a presentation to the Pecos Valley Grotto (the local chapter of the National Speleological Society in Carlsbad) on the use of geophysical tools for cave research and exploration.

Dr. Boston serves on the expert panel for creation of a new 21st Century initiative exhibit at the Museum of Science and Industry in Chicago. The new exhibit and accompanying public and educational outreach program centers around the theme of Exploration Science. Two meetings took place in 2003 (July 28-29 and Oct. 9-10) and are to be followed by a final meeting in 2004.

Dr. Land has been interacting extensively with the New Mexico Geological Society to promote cave and karst awareness within that regionally important body. In 2004, Dr. Land will serve as the Society's secretary, and in subsequent years is in-line to serve as treasurer, vice-president, and president of NMGS. Dr. Boston has just been named to the editorial board of the Society responsible for publishing the quarterly journal *New Mexico Geology*.

Research Grants and Contracts

This past year, New Mexico Tech engaged in extensive efforts to acquire external funding for new projects in cave and karst science. Several proposals were funded, several were rejected, and three were still outstanding as of January 2004. The funded proposals include a grant from the National Science Foundation Geobiology Program for a comparison of cave iron and manganese microorganisms and their surface desert varnish, counterparts in conjunction with a team at University of New Mexico, Albuquerque. A second funded effort through the National Aeronautics and Space Administration (NASA) ASTEP program will investigate the science of submerged caves in Mexico and the development of autonomous robotic explorers

Student activities in 2003 supervised by New Mexico Tech Cave and Karst Studies faculty included:

Setsuko Shindo,
MS student in Hydrology,
New Mexico Tech, Socorro

Active modeling work and field data acquisition is underway as part of Ms. Shindo's thesis project, which focuses on the micrometeorology of Carlsbad Cavern, under the advisement of Dr. Boston. Ms. Shindo is collecting an extensive set of parameters at various points using new, state-of-the-art sensors, in many cases specially modified for cave use. The modeling effort uses the newest version of FEMLAB partial differential equation-based software in an attempt to understand what governs the interior environment of this famous and well-visited national treasure. Beyond its intrinsic scientific interest, the National Park Service cave specialists at Carlsbad will be able to use the results to better manage the cave.

Misty Milleson,
MS student in Biology,
New Mexico Tech, Socorro

Ms. Milleson has just embarked on a master's degree program in the Biology Dept. at New Mexico Tech. Dr. Boston is a member of her advisory committee. The project is a molecular phylogenetic assessment of microbial activity in the deep subsurface as seen in deep gold mine adits in South Africa. These organisms are in the groundwater found within the deep hydrothermal karst systems within which much of the mining activity occurs. An additional focus of the study will be the search for biominerals that are unique to the cave/karst/subsurface environment.

Morgan Perrone,
MS student in Geology,
NMSU, Las Cruces

Dr. Boston is also serving as primary advisor and outside committee member for New Mexico State University graduate student Morgan Perrone who is pursuing a thesis project in Spider Cave in Carlsbad Caverns National Park. Morgan is looking at the origins of an unusual deposit known as "moonmilk," which occurs in some caves worldwide. The deposits in Spider, known as "Crisco", may come from a unique interaction between microorganisms and the parent limestone rock producing essentially a "living mineral". This project builds upon some of Boston's previous and current research in Spider Cave.

Marion Pfaffenhuemer,
visiting PhD student in Biology,
University of Salzburg, Austria

Ms. Pfaffenhuemer is an advisee of Dr. Helga Stan-Lotter, recognized expert in the microbiology of subsurface halite (rock salt) deposits. Dr. Lotter is interested in comparing the salt bodies at the Waste Isolation Pilot Plant in Carlsbad and the highly metamorphosed rock salt deposits of the Alps in her native Austria. From August 18 until October 5, 2003, Ms. Pfaffenhuemer, worked in Dr. Boston's laboratory to learn some of her cave geomicrobiology techniques. She also worked with scientists D. Northup and M. Spilde at the University of New Mexico in Albuquerque.

for use in both Earth caves and extraterrestrial sites like possible oceans on the Jovian moon Europa. A pilot study has been funded by the NASA Institute for Advanced Concepts to assess technologies for creation of microrobotic cave explorers to access human -inaccessible Earth and extraterrestrial caves. Funded projects will be administered through New Mexico Tech.

To help develop ideas for future funding, Dr. Boston attended the National Science Foundation Regional Conference held in Albuquerque March 23-25, 2003.

Meeting Organization

Lewis Land co-organized and led the New Mexico Bureau of Geology's 2003 Decision Makers Field Conference, *Water Resources of the Lower Pecos Valley*. A major focus of this year's conference was water resources in the karstic San Andres artesian aquifer, the principal source of water for irrigation in the Roswell Artesian Basin. Several stops provided opportunities to examine karst features that contribute to groundwater circulation within the artesian aquifer. Over 50 individuals attended the conference, including several New Mexico state legislators, as well as representatives from several state government agencies, including the Environment Department, Office of the State Engineer, Interstate Stream Commission, and the cabinet secretary for the Energy, Minerals, and Natural Resources Department. Participants also included representatives from the offices of Governor Bill Richardson, Senator Pete Domenici, Senator Jeff Bingaman, and 3rd District Representative Steve Pearce.

Drs. Land and Boston have undertaken organizing the 2006 New Mexico Geologic Society Fall Field Conference as a tour of important karst and cave geology sites in New Mexico. These three-day conferences include extensive lectures and demonstrations in the field. To familiarize themselves with the organization and running of such meetings, Land and Boston attended the 2003 conference.

Dr. Boston served as Technical Chair for the New Mexico Geological Society Annual Meeting held at New Mexico Tech on April 11, 2003. The meeting theme was Caves and Karst. NCKRI Director Hose delivered the keynote speech on caves and the role of NCKRI in promoting cave research, with special emphasis on New Mexico and the southwest.

Van Romero, Vice President - Research & Economic Development

CURRENT NEW MEXICO TECH STAFF
WORKING DIRECTLY WITH THE INSTITUTE:

TITLE	NAME/LOCATION
Director – Cave & Karst Program	Penelope Boston/Socorro
Karst Hydrologist	Lewis Land/Carlsbad
Vice President –Research & Econ. Dev.	Van Romero/Socorro
Associate Vice President	Richard Cervantes/Socorro
Director of Planning	Joe Galon/Socorro

Students in Lab-New Mexico Tech students look at analyses.

HISTORY OF THE INSTITUTE

Articles on the Institute's early development stage were published in:

- *Canyons & Caves*, Issue No. 19, Winter 2000-2001, A newsletter from the Resources Management Offices Carlsbad Caverns National Park (http://www.nps.gov/cave/pdfdocs/c%26c19.pdf)

- *Inside Earth*, A newsletter of the National Park Service Cave and Karst Programs, Vol. 3 No. 3, Winter 2000-2001 (http://den2s11.den.nps.gov/grd/geology/caves/newsletter.htm)

- *U.S. Geological Survey Karst Interest Group Workshop Proceedings*: U.S. Geological Survey Water-Resources Investigations Report 01-4011, p.52-55.

- April 2001 issue of *GSA Today*, a publication of the Geological Society of America, which reaches a broad range of geoscientists.

PRE-INSTITUTE ENABLING ACT HISTORY

Congress passed the landmark Federal Cave Resources Protection Act of 1988 creating a major impetus for Federal agencies involvement in cave and karst protection and management. This Act directed the Secretaries of the Interior and Agriculture to inventory and list significant caves on federal lands and provided for the management and dissemination of information about caves.

In 1990, Congress passed Public Law 101-578 directing the Secretary of the Interior, through the Director of the National Park Service (NPS), to establish and administer a Cave Research Program and prepare a report for Congress that examined the feasibility of a centralized National Cave and Karst Research Institute. The Secretary sent the National Cave and Karst Research Institute Study Report to Congress in December 1994.

The 1994 Report made the key recommendation that the NPS and another entity, probably academic in nature, should jointly administer the Institute. The report identified the NPS as the appropriate project lead because it managed 59 park units containing significant cave resources and already had a Cave and Karst Program in place. The report noted that the NPS would have ultimate responsibility for the Institute and would retain indirect control over its activities and programs, while the academic entity/managing partner would plan, coordinate, and administer the Institute and its programs.

THE NATIONAL CAVE AND KARST RESEARCH INSTITUTE ACT OF 1998

Congress passed the National Cave and Karst Research Institute Act of 1998, generally following the recommendations of the 1994 Report. The complete Act is available at ww2.nature.gov/nckri/legislat.htm and the inside back cover of this report. The legislation directed the Secretary of the Interior to create the Institute, acting through the National Park Service. It designated the Carlsbad, New Mexico, area as the home for the Institute and also stated that the Institute could either lease or build a suitable facility. Although the NPS would establish the Institute, Congress directed that it be jointly administered by the NPS and a private or public partner and operated in accordance with the 1994 Report to Congress. A key "matching funds" provision was inserted by Congress, directing that the Secretary of the Interior may spend federal funds for the Institute only to the extent that they are matched by an equal amount from non-federal sources. The Institute may accept grants from private persons and transfers of funds from other federal agencies. However, the current interpretation of the legislation requires that funds provided by any federal agency (e.g., USGS, USDA, EPA, NSF, NPS, etc.) to support Institute programs must also be equally matched by non-federal funds.

INITIAL DEVELOPMENT PHASE

The NPS assigned responsibility for implementing the Act jointly to the Intermountain Regional Office and the Geologic Resources Division, a national office. An initial challenge was that while the Act provided authority, Congress did not appropriate any funding for the Institute at that time. In July 2000, the Geologic Resources Division hired Interim Director Zelda Chapman Bailey on a term appointment to begin developing the Institute by defining the scope of operations, forming initial partnerships, securing both federal and non-federal funding, and developing proposed organizational structures and plans for a physical facility.

Interim Director Bailey's assignment emphasized developing collaborative relationships. She traveled extensively, networking at a personal level with a variety of groups across the Nation. Convened and participated in numerous formal and informal meetings within the NPS and with other federal agencies, with state agencies, Congressional staff, city officials, universities, foundations, and private groups. In addition, significant effort was devoted to networking via e-mail and phone conversations. Bailey also started a tradition of e-mailing monthly summaries

Interim Director Zelda Chapman Bailey

Federal Working Group meeting locations and dates:

Denver, Colorado
December 2000

Albuquerque, New Mexico
May 2001

San Antonio, Texas
September 2001

Tallahassee, Florida
February 2002

Carlsbad, New Mexico
August 2002

Mammoth Cave, Kentucky
February 2003

of Institute activities to interested individuals. An archive of the Institute's monthly summaries is available at: www2.nature.gov/nckri/month_sum.htm A web site for the Institute was launched in September 2001 to provide general information on the Institute to a wider audience and to solicit input into the formational process of the Institute. The site can be accessed at www2.nature.nps.gov/nckri.

FEDERAL WORKING GROUP

As part of this initial effort, the NPS established the National Cave and Karst Research Institute Federal Working Group. Twelve cave and karst land management experts represented the National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Environmental Protection Agency, and U.S. Geological Survey. They also communicated with cave and karst interest groups to provide their perspectives and to keep them informed on Institute activities.

The Federal Working Group met twice yearly between December 2000 and February 2003. Meetings took place in different cities to allow individuals with interest in the development of the Institute to attend. During those two-plus developmental years, the Federal Working Group provided guidance to the interim director as an indispensable sounding board and think tank concerning all aspects of establishing the Institute, and worked on a wide range of issues ranging from the Institute's mission and goals to building requirements, funding sources, and research priorities. The Federal Working Group also looked at the Institute's possible organizational structure, management issues, and potential models for advisory boards.

In December 2002, the National Park Service hired Dr. Louise Hose as the Institute's Director. The Interim Director's position tenure ended in April 2003.

Dave Shaver and Ronal Kerbo,
NPS – Geologic Resources Division

The Interim Director and the Federal Working Group created an incipient financial support program, utilizing NPS project funding for several projects during the Institute's Initial Development Phase.

Projects included:

- Collaboration with Karst Waters Institute to produce a booklet *Guidelines for Cave and Karst Management for America's Protected Lands;*

- Collaboration with U.S. Geological Survey to produce a USGS Circular (a magazine-style publication) on cave and karst science and management in the United States;

- Collaboration with USGS, other federal agencies, and university, state, and private groups to produce national and local karst maps and to make the integrated information available through an interactive website;

- Sponsoring publication of three cave-related books with the Denver Museum of Nature and Science, National Speleological Society, and Boston University;

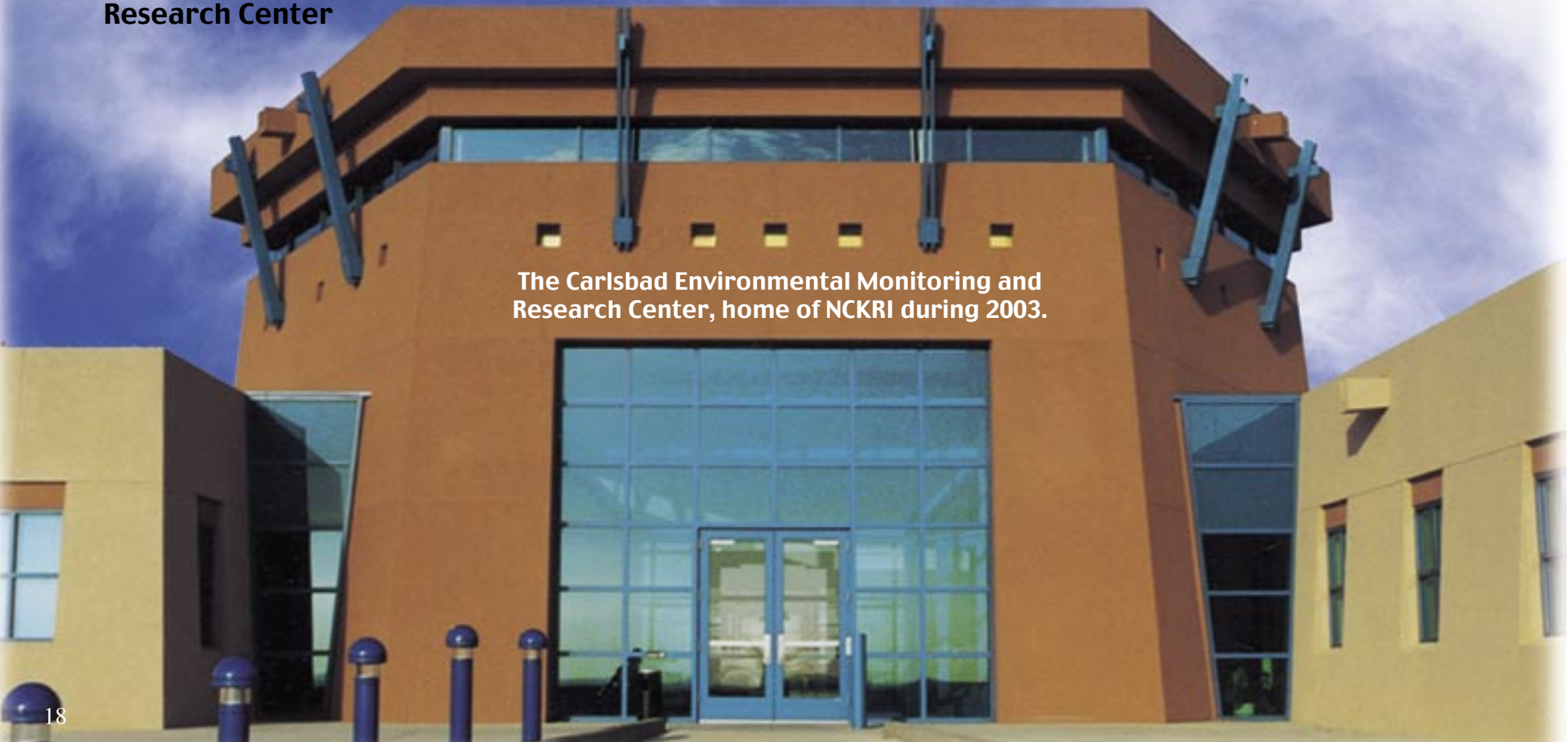
- Printing the American Cave Conservation Association *Exploring Caves and Karst Curriculum Guide* for their use and to support National Cave Association programs;

- Supporting Western Kentucky University projects to investigate bacterial DNA fragment profiles in cave sediments, and support for a masters degree program tailored to working resource managers.

FACILITY PARTNER

New Mexico State University – Carlsbad Carlsbad Environmental Monitoring and Research Center

A formal agreement signed with New Mexico State University in October 2000, made temporary office space and administrative support at its Carlsbad campus available to the Institute. The office is located in the university's Carlsbad Environmental Monitoring and Research Center (CEMRC), through an arrangement designed to facilitate collaboration between the two groups. The agreement was the first to be signed on behalf of the Institute, and provided an important bridge to establishing the Institute in Carlsbad until its headquarters building is completed. Lewis Land, a New Mexico Bureau of Geology and Mineral Resources hydrologist affiliated with NCKRI, established the Institute's first permanent presence in Carlsbad when he began the Bureau's karst hydrology program for southeastern New Mexico out of the CEMRC building during the summer of 2002. In December 2002, Louise Hose, the new Institute Director arrived in Carlsbad and set up her office in CEMRC's building. Throughout 2003, the facility provided two to three offices and computer network support for the Institute. Their support greatly facilitated establishing the physical presence of NCKRI in the Carlsbad community.

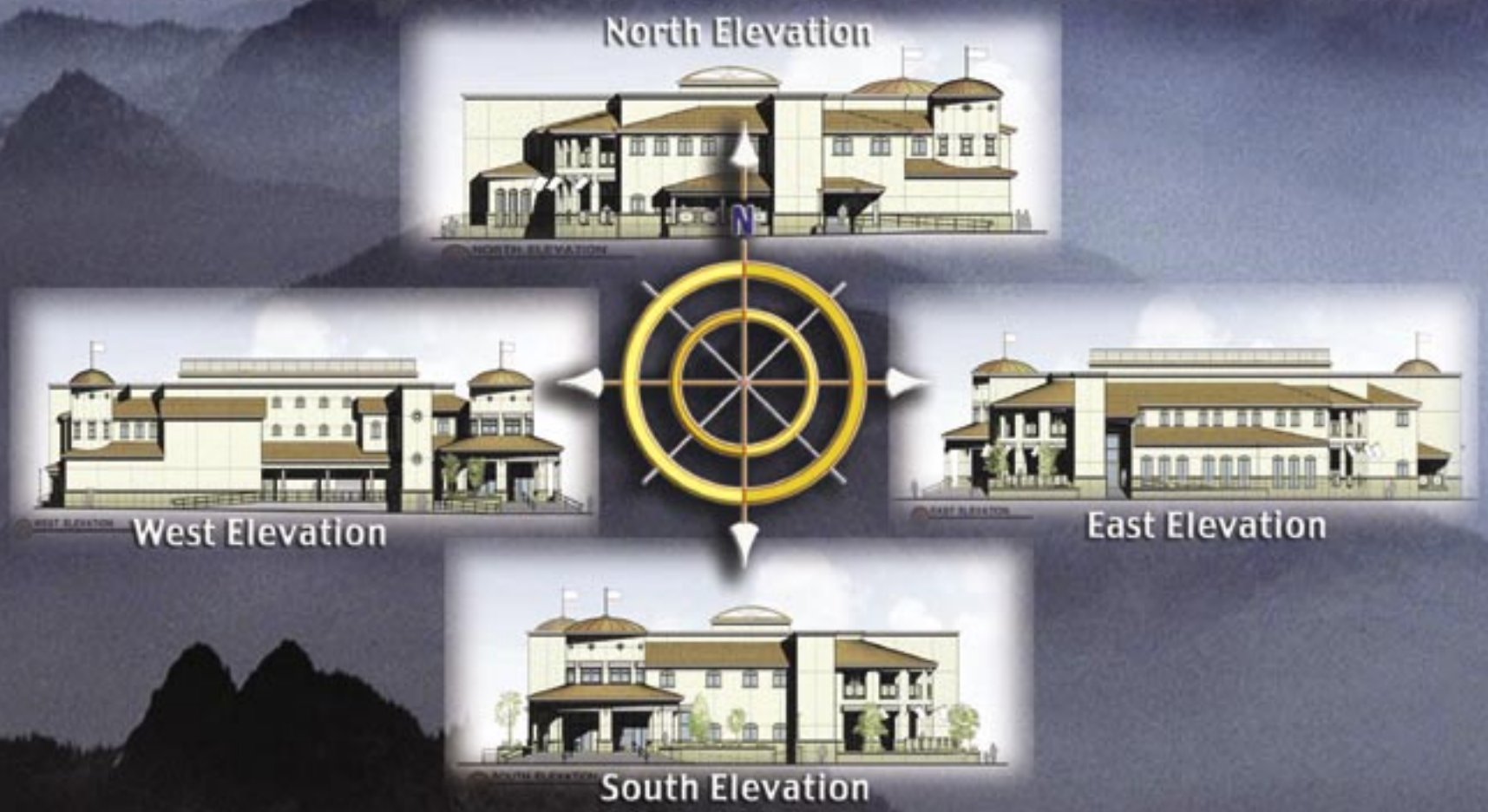


The Carlsbad Environmental Monitoring and Research Center, home of NCKRI during 2003.

NCKRI BUILDING PROJECT

The National Cave and Karst Research Institute (NCKRI) staff has already immersed itself in a major "bricks-and-mortar" project. Approximately $4.3 million has been allocated or pledged towards building a new research, education, and information management center near the banks of the Pecos River and downtown Carlsbad, New Mexico. As the year 2003 ended, NCKRI's staff, along with our primary partners, were working on the preliminary design of the two-story building.

The Enabling Legislation directs that the headquarters for NCKRI be located in the vicinity of (but not in) Carlsbad Caverns National Park, making the City of Carlsbad, New Mexico, the obvious site for centering operations. The strong support of the City of Carlsbad and its leaders' commitment to the Institute combined with the vision and funding of the National Park Service (NPS) and of the State of New Mexico through the New Mexico Institute of Mining and Technology (New Mexico Tech) brought the three entities together in support of the Institute headquarters building.



The City of Carlsbad has proposed locating the building in a major riverside redevelopment area to be known as The Cascades.

Financing for the approximately $4.3 million building comes from three sources. The NPS has allocated $1,956,900 towards the design and construction of the building. That money is in the process of being passed directly to the City of Carlsbad through a Cooperative Agreement. An additional $1.340 million has been provided to the City of Carlsbad for the project from the State of New Mexico. The City also pledged nearly $1 million of in-kind services towards the building that included the land and related infrastructure.

The February 2003 signing of a Memorandum of Understanding (MOU) by the Institute's three primary partners, the NPS, The City of Carlsbad, and New Mexico Tech, paved the way for the design and construction of a headquarters building for NCKRI. Among other

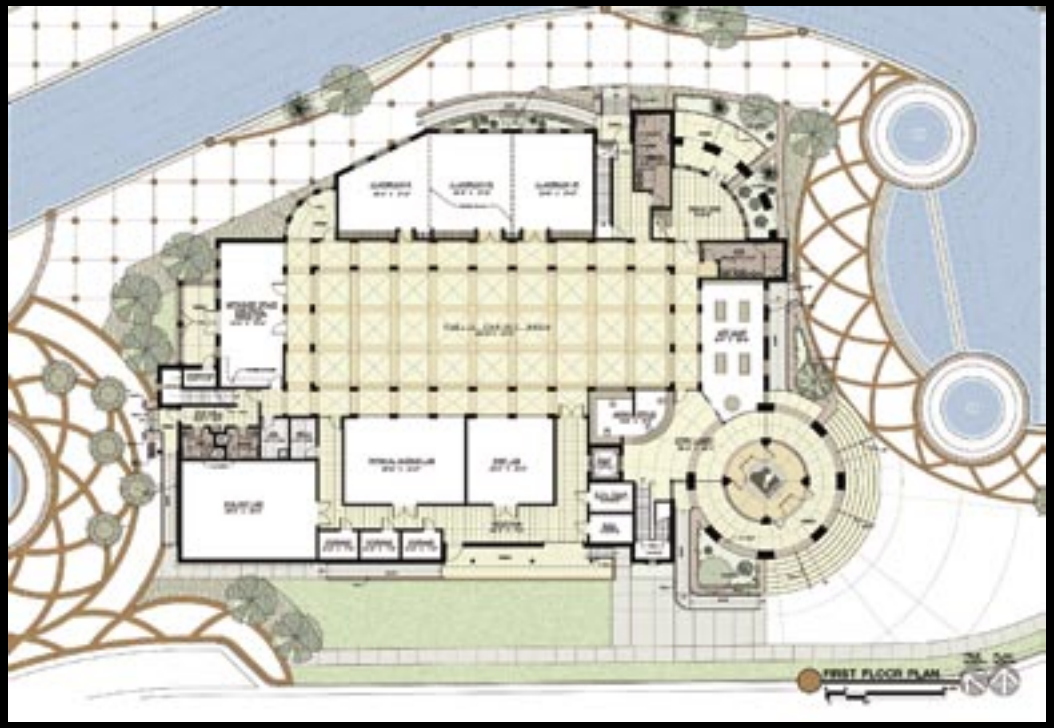
issues, the MOU established a basis for cooperation in planning the "Institute's physical facility" as well as any individual cooperative agreements related to the financing, construction, and operation of the Institute building.

As the year progressed, the three partners made great progress on the approximately 24,000 square foot building. The City of Carlsbad has proposed locating the building in a major riverside redevelopment area to be known as The Cascades. The NCKRI Building will anchor the commercial area to be built around a large canal water feature. Development of the Cascades is scheduled to occur on a parallel track with the Institute's building. Ground breaking is slated for mid- to late-2004.

In May, representatives from the three primary partners interviewed three potential Architecture and Engineering firms and recommended a joint venture team of Studio D Architects (Las Cruces, New Mexico) and Beryl Durham and Associates (Carlsbad, New Mexico). That recommendation was agreed to by the Carlsbad City Council, which accepted a bid from Studio D Architects and Beryl Durham and Associates in early summer 2003 to design and build the headquarters structure.

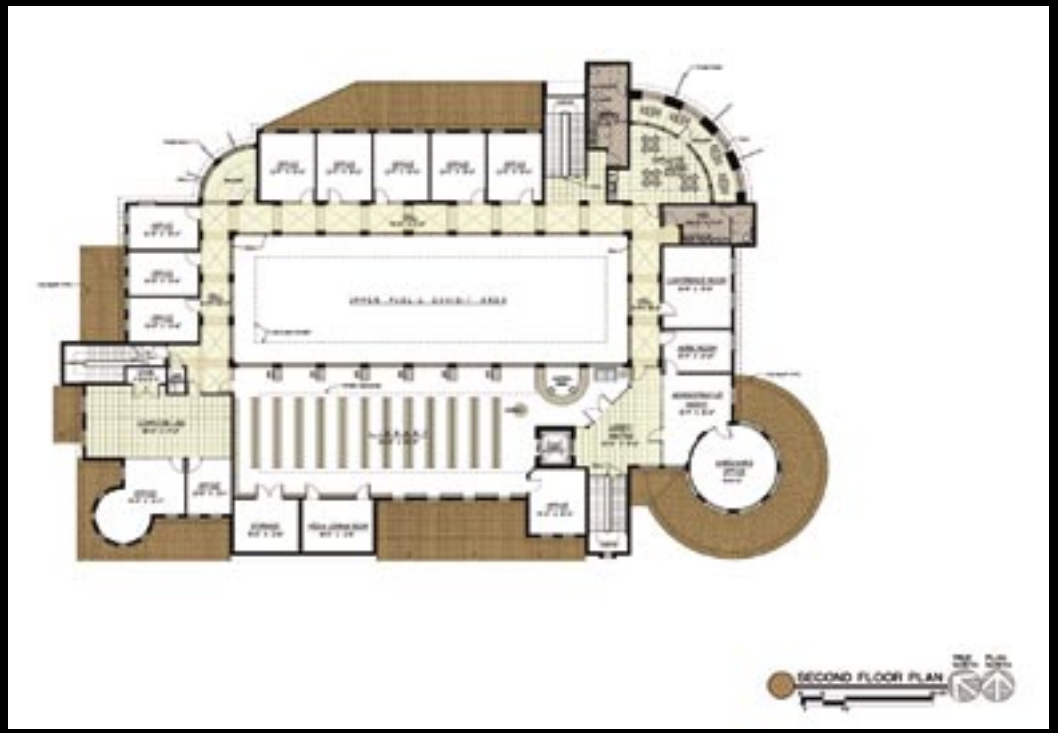
The Cascades, and the NCKRI Headquarters building, will feature Mediterranean Villa architecture with tile roofs, a canal-side esplanade and store fronts highlighted with terraces and awnings. The Cascades development plans call for open space areas accented with computer-run fountains and bridges that will tie together the theme of the development.

After receiving initial direction on the building from the NCKRI Director and the City of Carlsbad, the architect and engineering firms began their design work. They presented preliminary drawings to the Institute and its partners in November and revised them in December 2003. Construction documents will be finalized during early 2004.



FIRST FLOOR

- Entry lobby
- Large, two-plus story high public exhibit area
- Reception / administrative area
- Three unfinished laboratory spaces
- Large classroom divisible into 3 smaller classrooms
- Potential gift shop and snack bar areas
- Four storage rooms
- Two women's and two men's bathrooms
- Large, unfinished room



Current NCKRI headquarters building plans include approximately 24,000 square feet comprising:

SECOND FLOOR

- Thirteen offices (large enough to accommodate two workers each)
- Library designed for future addition of mezzanine
- Media viewing room
- Computer laboratory
- Two storage areas
- Employee's lounge/kitchen
- Conference room
- Work/mail/copy room
- One men's and one women's bathroom

SPONSORED PROJECTS

USGS—Circular

The Institute and U.S. Geological Survey (USGS) are collaborating to produce a USGS Circular (a magazine-style publication available to the public at no charge) on the topic of cave and karst science, resource management, and research needs in the federal agencies, tentatively titled *The Nation's Cave and Karst Resources: Science and Management*.

In addition to the Institute and USGS, sections of the report have been written by staff from the National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, U.S. Forest Service, and the Environmental Protection Agency. Authors contributed their writing time and, Zelda Bailey, the former interim director, continues editing and compiling the publication. The USGS is funding the cost of preparation, printing, and distribution in 2004.

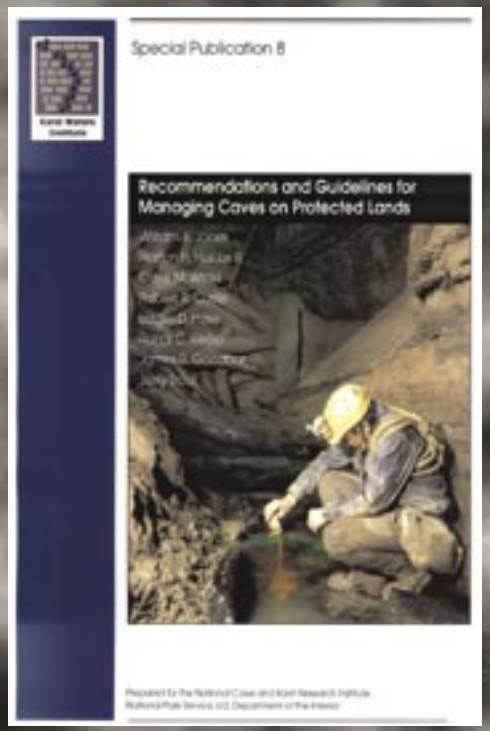
The manuscript for the circular was under final review by the USGS staff and others in January 2004 and a publication schedule was being developed. Publication is expected in the first half of 2004.

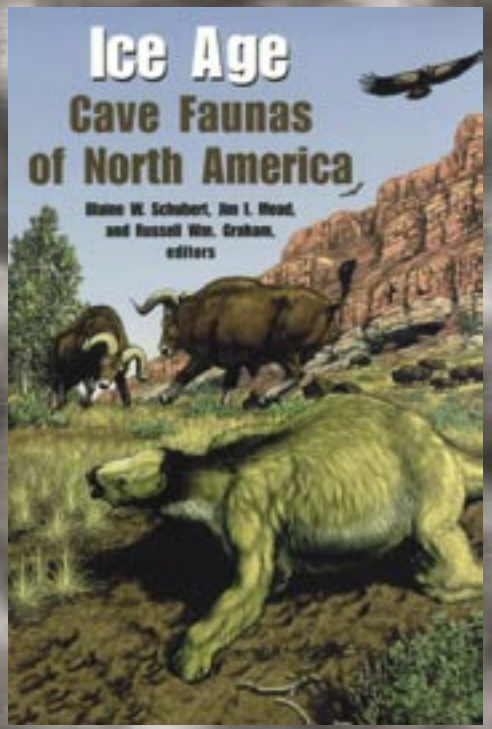
USGS—National Karst Map

In response to the increasing need for accurate and detailed information about the distribution and types of karst terrains in the United States, the USGS has worked with a group of karst experts to develop a long-term plan for mapping the nation's karst. The product will be a national, web-based karst map documenting various karst-related features, such as the distribution of carbonate and evaporite units, karst aquifers, buried karst, pseudokarst landscapes, and percentage of area covered by karst. The national map will be developed in partnership with state geological surveys and academic entities using information derived primarily from maps prepared by the individual states and will link to state- and local-scale maps and related data. The National Cave and Karst Research Institute will establish the web-based network of karst information used to build the national map. The web site will be designed to educate the public and legislators about karst issues, to provide a basis for cave and karst research, and to aid federal, state, and local land-use managers in managing karst resources.

The USGS Karst Map Project activities for 2003 included:

- Initial compilation of a 1:1,000,000 scale Appalachian Highlands regional karst map from digital geologic and karst maps supplied by the individual state geological surveys;
- Finished digitization of karst map of Puerto Rico at 1:140,000 scale;
- A 2-day workshop on karst mapping in the western interior of the U.S.A. with emphasis on evaporate karst (June 3-5, 2003). It was attended mainly by representatives from state and federal agencies and was hosted by the Colorado Geological Survey;
- Participation in a 1-day field trip to Pennsylvania (PA) and New Jersey (NJ) examining karst features in northeastern PA and northwestern NJ





Karst Waters Institute – Management Book

NCKRI and the Karst Waters Institute (KWI) collaborated to produce a booklet titled *Recommendations and Guidelines for Managing Caves on Protected Lands*. Associates of KWI and staff from the National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, and U.S. Forest Service contributed sections. NCKRI and USFWS provided funding. KWI edited, published, and distributed the booklet in the fall of 2003. It will be used as a handbook for resource managers to comply with the requirements of the Federal Cave Resources Protection Act, as a source of information for interpreters, and as a training resource.

National Speleological Society – Cave Conservation Book

The Institute provided partial funding to publish a book compiled by the National Speleological Society titled *Cave Conservation and Restoration*, which features conservation and restoration topics by researchers from a variety of disciplines and chapters dedicated to specific conservation measures and restoration techniques. In January 2004, David McClurg, the Chair of the NSS Special Publications Committee, reported that the book was into the last stages of review prior to publication and was scheduled for completion by the end of February 2004

Boston University

The Institute provided partial funding to the Center for Ecology and Conservation Biology at Boston University to publish a book titled *A Guide to Bats of North America*, which features information on the life-history, ecology, and behavior of 45 species of bats known from North America, half of which depend on or utilize caves.

Mississippi State University – Digital Map of Karst in Mississippi

In 2003, John E. Mylroie of the Department of Geosciences at Mississippi State University initiated a project to produce a digital map of the State of Mississippi with karst features and karst drainage basins produced following the guidelines and procedures of the National Karst Map program. The digital data will be annotated with descriptions of the karst features and interpretations and land use implications of those features. Christopher Moore, a graduate student in the Department of Geosciences, began the project in the summer of 2003. Field and literature search data are being placed in a data inventory and a Geographic Information System (GIS) to establish the relationship of cave and karst features with topography, geology, and cultural features.

NCKRI funded the project for $6,000 the first year (FY03) and $6,100 for the second year (FY04). The funding is matched by the Department of Geosciences with one graduate student assistantship ($5,400/year, plus full waiver of in-state tuition). The Department also provides its GIS laboratory to the project at no cost.

Denver Museum of Nature and Science

The Institute provided partial funding to publish *Ice Age Cave Faunas of North America* compiled by the Denver Museum of Nature and Science (DMNS). Indiana University Press and the DMNS jointly published the book in October 2003.

Western Kentucky University Graduate Program

Western Kentucky University has, over the last several years, developed a graduate program tailored to the needs and schedules of NPS cave and karst resource management specialists who wish to further their educational background. Under a cooperative agreement with WKU, the Institute supports this program to allow more students access to the benefits of advanced education.

Snottites - Microbial growths in Mexican cave.

SPONSORED PROJECTS

NHK – Japanese Broadcasting Corporation

The Japanese Broadcasting Corporation (NHK) provided the Institute with an outstanding opportunity to pursue many of our designated purposes by inviting NCKRI staff and volunteers to serve as consultants and "talent" for a high-definition, science documentary film on Cueva de Villa Luz in southern Mexico. By assisting in this endeavor, NCKRI furthered the science of speleology, fostered interdisciplinary cooperation in a cave research program, promoted public education about caves, obtained non-federal matching funds, and promoted international cooperation in protecting caves.

NCKRI Director Louise Hose of the National Park Service has led the investigation of Cueva de Villa Luz and NHK asked her to organize a team of scientists to support their filming effort. NHK paid all expenses plus salary costs or a stipend for each investigator's time spent in the field.

NHK expects to make at least two versions of the show: A one-hour, Japanese domestic science documentary and a two-hour, international (in Japanese) adaptation. They are also investigating the possibility of marketing an English version.

Biologists Doug Soroka and Lynn Kleina pose with crew from the Japanese Broadcasting Corporation, after filming in the extremely challenging Yellow Roses passage of Cueva de Villa Luz. Photo NHK.

Penny Boston and Diana Northup pose with the crew from the Japanese Broadcasting Corporation. Photo by K. Ingham.

Participants included:

- Geomicrobiologist Penelope Boston of the New Mexico Tech wing of NCKRI
- Geologist Louise Hose of the NPS wing of NCKRI
- Caver Ken Ingham of the University of New Mexico
- Microbiologist Lynn Kleina of the National Speleological Society
- Biologist Kathleen Lavoie of State University of New York – Plattsburg (Dr. Lavoie also brought along an undergraduate student)
- Caver David Lester of the National Speleological Society
- Microbial ecologist Diana Northup of University of New Mexico
- Biologist Doug Soroka of the National Speleological Society

OUTREACH AND INSTITUTIONAL BUILDING EFFORTS

Summer Efforts

Reaching out to cave and karst program leaders at non-federal government agencies, U.S. academic institutes, and other non-governmental groups to explore how the Institute might work with those programs constituted one of the Institute's major activities in 2003. Individual discussions and correspondence took place with representatives of more than a score of colleges and universities, the Cave Research Foundation, the National Speleological Society, Edwards Aquifer Authority, Ozark Underground Laboratory, Environmental Systems Research Institute, Los Alamos and Sandia National Laboratories, the New Mexico State Lands Office, and others. Most of the interaction focused on potential collaborations.

In June, the Institute staff initiated a significant outreach campaign to the broad cave and karst community that involved a request for input from a diverse group of stakeholders, including federal, state, and local government agencies, non-government organizations, and academic programs. In July, the Director sent out a letter to about 100 representatives of diverse U.S. cave and karst programs (governmental, academic, and non-profit) requesting input and suggestions concerning future Institute operations and administration.

Participants in NCKRI's Vision Building Workshop in October 2003:

Vision Building Workshop

The Institute held a facilitator-run, two-day meeting with a group of cave/karst program representatives to discuss the Institute's operational and administrative vision. Susan Warner of LEAD Alliance provided professional facilitation for the meeting. Louise Hose, Dave Shaver, Ed Kassman, and Lindsay McClelland of the NPS Geologic Resources Division, Associate Director Mike Soukup (NPS Washington Office), Penny Boston (New Mexico Tech), and representatives from five other academic institutes, two state programs, five non-profit organizations, two national parks, and five other federal agencies (BLM, USFS, USGS, EPA, USFWS) participated.

Penny Boston
Geomicrobiology Professor
New Mexico Institute of Mining & Technology

Chuck Barat
Chief of Resources
Carlsbad Caverns National Park, National Park Service (NPS)

Nick Crawford
Geography Professor
Western Kentucky University

Bob Currie
Wildlife Biologist
US Fish and Wildlife Service

Mark DePoy
Chief of Resources
Mammoth Cave National Park, NPS

Malcolm Field
Environmental Protection Agency

Dave Foster
Executive Director
American Cave Conservation Association

Hal Hallett
Recreational Planner
Bureau of Land Management

Jack Hess
Executive Director
Geological Society of America

Horton Hobbs,
Biology Professor
Wittenberg University

Louise Hose
Director
National Cave and Karst Research Institute, NPS

Edward Kassman
Policy Analyst
Geologic Resources Division, NPS

Kathy Lavoie
Dean
State University of New York

Pat Leahy
Associate Director
U.S. Geological Survey

Jon Martin
Hydrology Professor
University of Florida

Lindsay McClelland
Washington,D.C. Liaison
Geologic Resources Division, NPS

Hazel Medville
Federal Liaison
National Speleological Society

Jim Miller
Dispersed Recreation Program Manager,
U.S. Forest Service

Randy Orndorff
Associate Program Coordinator
U.S. Geological Survey

Michael Queen
Adjunct Geology Professor
Pomona College

Scott Schulte
Park Superintendent
Rock Bridge Memorial State Park, Missouri

Dave Shaver
Chief
Geologic Resources Division, NPS

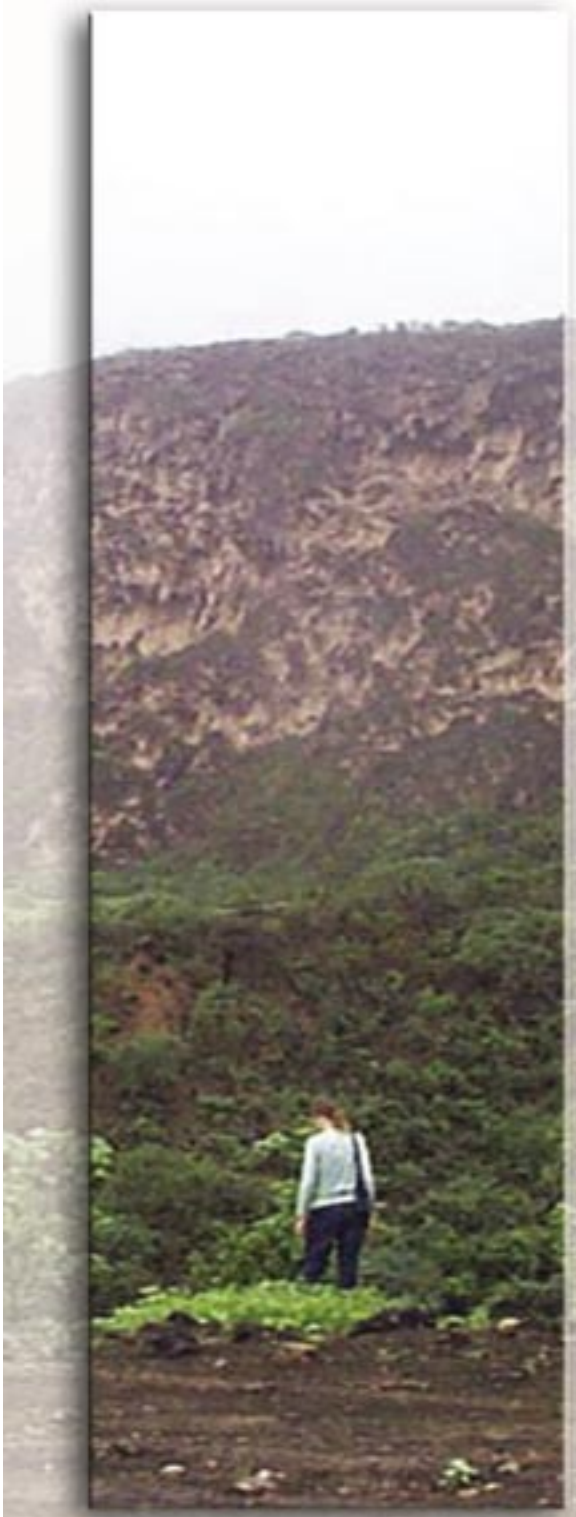
Mike Soukup
Associate Director Natural Resourses
NPS

Rickard Toomey
President
Cave Research Foundation

Sue Warner
Contracted Facilitator
Lead Alliance

Carol Wicks
President
Karst Waters Institute

Carol Zokaites
Educator
Virginia Karst Education Program



Warner wrote a summary of the contributions made by Vision Workshop participants. The material was mailed to workshop participants and the former Federal Working Group. Copies of the Executive Summary and supporting data are available by request sent to nckri-mail@cemrc.org and are posted on the NCKRI website at: http://www2.nature.nps.gov/nckri/workshop.htm.

One element of the Vision Building Workshop was the review and discussion of a number of organizational models. Models included government-government partnerships, government-university partnerships, government owned/ contractor operated operations, science and technology centers, and the organizational structures of the Desert Research Institute and the Smithsonian Institution. No one model was accepted as the best; however, a list of pros and cons for each was developed and included in the summary.

Organizational Planning

During the course of the year, the Institute Director discussed the creation of a 501.c.3 (non-profit, educational) organization and the potential benefits of it, including the ability to fundraise. This involved conversations with organizations including the Carlsbad Department of Development, the Fermi National Accelerator Laboratory, and the Institute for Regulatory Science.

Institute staff began working on a NCKRI Business Plan, striving to incorporate the views of the Vision Building Workshop participants. They met twice with Larry Coalson of the New Mexico State University's Small Business Development Center in Carlsbad on the structuring and writing of a business plan. Coalson also shared mid-1990s documents covering NCKRI strategic planning, proposed budgeting, and operating and staffing plans. Work on the plan will continue into 2004.

NCKRI Web Site

The NCKRI web site, developed with the assistance of Jim Wood in the Geologic Resources Division, was used extensively during the past year as a communications tool to reach a broad audience of stakeholders and the general public. This effort included the posting of monthly reports on Institute progress, NCKRI building drawings, Vision Building Workshop related documents, partnerships, and a welcome by the director. The web site also provides Institute contact information.

National Cave & Karst Research Institute Logo

The Institute solicited comments on what its logo should look like and what elements it should include. This input was compiled and sent to a graphic designer who produced several designs that were posted for comment on the nckri web site. After reviewing the comments a final design was chosen.

NCKRI

INSTITUTE ACTIVITIES

a. REFEREED PAPERS

Boston, P.J., Frederick, R.D., Welch, S.M., Werker, J., Meyer, T.R., Sprungman, B., Hildreth-Werker, V., Thompson, S.L., & Murphy, D.L., 2003, Human utilization of subsurface extraterrestrial environments: *Gravity & Space Biology Bulletin*, v. 16, n. 2, p. 121-131.

Boston, P.J. 2004. Lava tube structures on Earth and Mars: Formation and geomicrobiology: *Planetary Space Sciences Journal* [in press].

Boston, P.J., 2004, Caves on Mars: *Icarus* [in press].

Northup, D.E., Barns, S.M., Yu, L.E., Spilde, M.N., Schelble, R.T., Dano, K.E., Crossey, L.J., Connolly, C.A., **Boston, P.J.**, Natvig, D.O., & Dahm, C.N., 2003, Diverse microbial communities inhabiting ferromanganese deposits in Lechuguilla and Spider Caves: *Environmental Microbiology*, v. 5, n. 11, p. 1071-1086.

b. ARTICLES IN EDITED GUIDEBOOKS AND PROCEEDINGS

Boston, P.J., Frederick, R.D., Welch, S.M., Werker, J., Meyer, T.R., Sprungman, B., Hildreth-Werker, V., & Thompson, S.L. 2004. Extraterres-trial caves as science targets for future missions: *Space Technology and Applications Forum 2003 Proceedings*, AIP #654. American Institute of Physics, College Park, MD.

Dubowsky, S., Iagnemma, K., **Boston, P.J.**, *et al*., 2003, Microsphere explorers for intelligence gathering in debris, caves, and other subterranean environments: DARPA White Paper BAA03-01.

Hose, L.D., 2003, Eastern Sierra field trip guide, *in* Proffitt, M. (ed.), Range of light, realms of darkness: *A guidebook for the 2003 NSS Convention*: National Speleological Society, Huntsville, Alabama, p. 83-95.

Land, L., 2003, Regional geology of the Pecos Country, *in* Johnson, P.S., **Land, L.**, Price, L.G., & Titus, F. (eds.), *Water resources of the lower Pecos Region, New Mexico: Science, policy, and a look to the future*: New Mexico Bureau of Geology and Mineral Resources, 2003 New Mexico Decision Makers Guidebook, p. 9-13.

c. CONTRIBUTIONS TO EDITED BOOKS

Boston, P.J., 2004, Biofilms: *in* Gunn, J., *Encyclopedia of Cave and Karst Science*, Fitzroy Dearborn Publishing, London, p. 145-147.

Boston, P.J., 2004, Extraterrestrial caves: *in* Gunn, J., *Encyclopedia of Cave and Karst Science*, Fitzroy Dearborn Publishing, London, p. 355-358.

Boston, P.J., Lavoie, K., & Northup, D. 2004. Preserving the unseen as you clean, in Hildreth-Werker, V., (ed.), *Cave Conservation and Restoration*, NSS, Huntsville, Alabama [in press].

Hose, L.D., 2004, Cueva de Villa Luz, Mexico, *in* Gunn, J., *Encyclopedia of Cave and Karst Science*, Fitzroy Dearborn Publishing, London, pl 758-759.

Hose, L.D., 2004, Golondrinas and the giant shafts, Mexico, *in* Gunn, J., *Encyclopedia of Cave and Karst Science*, Fitzroy Dearborn Publishing, London, p. 392-393.

Hose, L.D., 2004, Huautla cave system, Mexico, *in* Gunn, J., *Encyclopedia of Cave and Karst Science*, Fitzroy Dearborn Publishing, London, p. 427-428.

Hose, L.D., 2004, Selma Plateau caves, Oman, *in* Gunn, J., *Encyclopedia of Cave and Karst Science*, Fitzroy Dearborn Publishing, London, p. 639-641.

Jones, W.K., Hobbs, H.H., Jr., Wicks, C.M., Currie, R.R., **Hose, L.D.**, Kerbo, R.C., Goodbar, J.R., & Trout, J., 2003, *Recommendations and guidelines for managing caves on protected lands*: Karst Waters Institute Special Publication 8, Charles Town, WV, 95 p.

Land, L., 2004, Evaporite karst and regional ground water circulation in the lower Pecos Valley, *in* Johnson, K.S. & Neal, J.T. (eds.), *Evaporite Karst and Engineering and Environmental Problems in the United States*: Oklahoma Geological Survey Circular 109 [in press].

d. PUBLICATIONS EDITED

Boston, P.J., 2003, *Astrobiology Journal* (refereed journal). Senior Editor, v. 3.

Hose, L.D., 2003, *Journal of Cave and Karst Studies* (refereed journal). Chief Editor, v. 65, n. 1-3.

Johnson, P.S., **Land, L.**, Price, L.G., & Titus, F. (eds.), *Water Resources of the Lower Pecos Region, New Mexico: Science, Policy, and a Look to the Future:* New Mexico Bureau of Geology and Mineral Resources, 2003 New Mexico Decision Makers Guidebook, 148 p.

Miller, J.E., S.H. Schneider, Crist, E., & **Boston, P.J.**, (eds.), 2004, *Scientists on Gaia: New winds blowing*, MIT Press.

e. ABSTRACTS

Hose, L.D., 2003, Cave and karst studies at the beginning of the 21st Century: The New Mexico connection: *New Mexico Geological Society Proceedings Volume*, 2003 Annual Spring Meeting, Socorro, New Mexico, p. 24.

Hose, L.D., Bailey, Z.C., Boston, P.J., & **Land, L.,** 2003, America's National Cave and Karst Research Institute 2003: The gearing up phase [abst.]: *Journal of Cave and Karst Studies*, v. 65, n. 3, p. 185.

Hose, L.D., **Bailey, Z.C., Land, L.**, & **Boston, P.J.**, 2003, America's National Cave and Karst Research Institute 2003: The gearing up phase [abst.]: *Geo²*, v. 30, n. 2 & 3, p. 38.

Hose, L.D., Bailey, Z.C., Land, L., & **Boston, P.J.**, 2003, America's National Cave and Karst Research Institute 2003: The gearing up phase: *New Mexico Geological Society Proceedings Volume*, 2003 Annual Spring Meeting, Socorro, New Mexico, p. 25.

Hose, L.D., & **Boston, P.J.**, 2003, Cave and karst studies at the beginning of the 21st Century: Role of the National Cave and Karst Research Institute: *GSA Abstracts with Programs*, v. 35, no. 7, p. 452.

Hose, L.D., & **Boston, P.J.**, 2003, The National Cave and Karst Research Institute: Defining its role in cave and karst management [abst.]: *Journal of Cave and Karst Studies*, v. 65, n. 3, p. 175.

Hose, L.D., & **Boston, P.J.**, 2003, The National Cave and Karst Research Institute: How will it address its science mandate? [abst.]: *Journal of Cave and Karst Studies*, v. 65, n. 3, p. 186.

Land, L., 2003, Role of evaporite karst in hydrology and morphologic evolution of the lower Pecos Valley, New Mexico, USA: *GSA Abstracts with Programs*, v. 35, no. 6, p. 316.

Land, L., 2003, *Role of evaporite karst in regional ground water circulation in the lower Pecos Valley: New Mexico Geological Society Proceedings Volume*, 2003 Annual Spring Meeting, Socorro, New Mexico, p. 36.

f. EDITORIALS

Boston, P.J., 2003, The National Cave and Karst Research Institute: American speleology's remarkable opportunity: *Journal of Cave and Karst Studies*, v. 65, n. 1, p. 87.

g. GRANT PROPOSAL, REFEREED JOURNAL, AND OTHER REVIEW PANELS

- *Astrobiology Journal* (Boston-9)
- DARPA (Boston-2)
- *Geomicrobiology Journal* (Boston-1)
- *Gravity and Space Biology Journal* (Boston-2)
- *Journal of Hydrology* (Hose-1)
- *New Mexico Geology* (Land-2)
- *Water Resources of the Lower Pecos Region* (Land)
- National Aeronautic and Space Administration (Boston-2 proposals)
- National Geographic Society grant programs (Hose-1; Boston-2)
- National Institutes for Water Resources/U.S. Geological Survey National Competitive Grant Program (Hose-1)
- National Research Council/DOE Committee on Novel Approaches to the Management of Greenhouse Carbon: Advanced Subsurface Technologies Subgroup (Boston-panel, 2 proposals)
- National Science Foundation (Hose-1 panel + 2 proposals; Boston-2 proposals)

h. GRANT WRITING ACTIVITIES

- National Institute of Health's International Cooperative Biodiversity Groups grant proposal (Hose – Co-PI)
- National Science Foundation Science and Technology Center grant proposal (Boston - PI, Hose – Co-PI)

i. CONFERENCE AND FIELD TRIP LEADERSHIP

- International Conference on Karst Hydrogeology & Ecosystems Field Trip to Southeastern New Mexico (Land – 1-day leader, Scott provided assistance to 4-day trip)
- National Speleological Society National Convention's Eastern Sierra Geology Field Trip (Hose - Organizer and leader)
- New Mexico Bureau of Geology's 2003 Decision Makers Field Conference *Water Resources of the Lower Pecos Region, New Mexico* (Land - Leader).
- New Mexico Geological Society 2007 field conference featuring caves and karst in southeastern New Mexico - Successful proposal and planning (Boston, Land)
- New Mexico Geological Society spring conference in Socorro, New Mexico, including two successful, half-day Cave and Karst sessions (one poster, one oral) (Boston - Organizer)

j. PROFESSIONAL PRESENTATIONS

- Geological Society of America national meeting in Seattle, Washington - Poster presentations, *Role of evaporite karst in*

hydrology and morphologic evolution of the lower Pecos Valley, New Mexico (Land) and *Cave and karst studies at the beginning of the 21st Century: Role of the National Cave and Karst Research Institute* (Hose)
- Institute of Ecotecnics Annual Meeting, Synergia Ranch, Santa Fe, NM (Boston)
- International Conference on Karst Hydrogeology and Ecosystems at Western Kentucky University (WKU) in Bowling Green, Kentucky - Poster presented (Hose, Boston)
- Karst Waters Institute's *Interdisciplinary Workshop on Epikarst* in Shepherdstown, West Virginia - Poster presentation, *America's National Cave and Karst Research Institute 2003: The gearing up phase* (Hose).
- Mayfield Distinguished Lecturer, Bowling Green Univ., OH (Boston)
- Cuyahoga National Park, Distinguished Lecture Series (Boston)
- NPS Water Resources Division in Fort Collins and the NPS Geologic Resources Division in Lakewood, Colorado – Separate oral presentations, *Role of the National Cave and Karst Research Institute in the 21st Century* (Hose)
- National Speleological Society National Convention in Porterville, California - Three oral presentations (Hose, Boston), and two posters (Boston, Hose).
- National Cave and Karst Management Symposium in Gainesville, Florida - Oral presentation, *National Cave and Karst Research Institute 2003: Working through partnerships towards America's future* (Hose).
- New Mexico Geological Society spring conference in Socorro, New Mexico - One poster, *America's National Cave and Karst Research Institute: The gearing up phase* (Hose), one oral presentation, *Role of evaporite karst in regional ground water circulation in the Lower Pecos Valley* (Land), and the keynote address, *Cave and karst studies at the beginning of the 21st Century: The New Mexico connection* (Hose).
- New Mexico Institute of Mining and Technology - Oral presentation *Frontiers of Cave and Karst Science* (Land).
- New Mexico Tech Earth & Environmental Sciences Department Seminar (Boston)
- New Mexico Tech Chemistry Department Seminar (Boston)
- New Mexico Tech Biology Dept. talk (Boston)
- New Mexico State University colloquium talk, Las Cruces, NM (Boston)
- University of Texas-El Paso Geological Sciences Department Seminar – 2 presentations (Land and Boston).
- U.S. Geological Survey in Reston, Virginia – Oral presentation *National Cave and Karst Research Institute*: Update 2003 (Hose)

k. COMMUNITY PRESENTATIONS/EDUCATION

- American Association of University Women, Doylestown, Pennsylvania (volunteers Kleina & Soroka)
- Boy Scouts Venturing Program, Allentown, Pennsylvania (volunteers Kleina and Soroka)
- Carlsbad Lions Club – *Role of the National Cave and Karst Research Institute in the 21st Century* (Hose)
- Carlsbad Kiwanis Club – *Role of the National Cave and Karst Research Institute in the 21st Century* (Hose)
- Carlsbad Potash Section of the Society of Mining Engineers – *The National Cave and Karst Research Institute: What we are doing, where we are headed* (Hose).
- Carlsbad Rotary Club – *Role of the National Cave and Karst Research Institute in the 21st Century* (Hose)
- Cuyahoga National Park, Ohio, distinguished lecturer (Boston)
- New Mexico Tech Earth Research Day, cave seminar for prospective students (Boston)
- New Mexico Tech Earth Science Olympiad cave research talk (Boston)
- Pecos Valley Grotto of the National Speleological Society (Land).
- Sally Ride Club for Middle School Girls, live webcast (Boston)
- Sigma Xi Annual Dinner, banquet speech (Boston)

l. MAJOR MEDIA PROJECTS AND PUBLICITY

- British Broadcasting Corporation (Hose)
- *Current-Argus* newspaper, Carlsbad, NM (Hose, Scott)
- GSA Connection (http://www.geosociety.org/MbrNews/0311/prNCKRI.htm).
- *Geotimes* magazine (Hose)
- KCCC hour-long interview in Carlsbad, New Mexico (Hose)
- KTEP interview, the local public radio station in El Paso, Texas (Land)
- NHK (Japanese Broadcasting Corporation) Television (Hose, Boston, numerous volunteers).
- *Nature* magazine (Hose)
- *Space.com* magazine (Boston) http://www.space.com/scienceastronomy/mars_caves_030905.html)
- Super Science, a science magazine for middle school age children (Hose)

m. CAVE RESEARCH, ASSESSMENT, AND ADVISORY EFFORTS

Projects were continued or begun in a number of cave study sites this year. In some cases, expert advice was sought from NCKRI personnel on the research potential of various caves. The following list gives a brief synopsis.

- Carlsbad Caverns science instrument planning (Boston)
- Cueva de las Barrancas, NM, Trip to assess previous geomicrobial inoculations (Boston)
- Cueva de Villa Luz, Tabasco, Mexico, with NHK Japan film crew (Hose, Boston, volunteers)
- Endless Cave and Spider Cave sampling and assessment trips (Boston)
- Ft. Stanton Cave, NM - Snowy River science assessment trips and advising with emphasis on paleohydrology, geomicrobiology, and age dating (Boston, Land, Hose)
- La Tetera Cave, Arizona science assessment trip, Tucson, AZ (Boston)
- MIT Field and Space Robotics team taken to see lava tubes in El Malpais National Monument, NM (Boston)
- Study of evaporite karst phenomena and relationship to regional groundwater circulation in the lower Pecos Valley (Land)
- Study of groundwater circulation within the San Andres Artesian Aquifer, principal fresh water source for Roswell Artesian Basin, NM (Land)
- Assessment of groundwater discharge from Bottomless Lakes cenotes, and possible geologic hazard from gypsum karst subsidence (Land)
- Systematic water level baseline measurements in irrigation wells throughout the Roswell Artesian Basin to assess response of Artesian Aquifer to drought (Land)

n. PROFESSIONAL MEETINGS ATTENDED

- Cooperative Ecosystem Studies Units Network meeting,Washington, D.C. (Hose)
- Geological Society of America, Seattle, Washington (Hose, Land)
- George Wright Society conference, San Diego, California (Hose)
- Hydrogeology Consortium Florida Karst Workshop, Florida (Ron Kerbo represented NCKRI)
- International Conference on Karst Hydrogeology & Ecosystems, Bowling Green, KY (Hose, Boston)
- Mars Society Conference, Eugene, Oregon (Boston)
- NIAC Principal Investigators meeting Atlanta, Georgia (Boston)
- NASA NSCORT meeting, banquet speech, Purdue University, Indiana (Boston)
- National Cave and Karst Management Symposium, Gainesville, Florida (Hose)
- National Speleological Society Annual Convention, Porterville, CA (Boston, Hose)
- New Mexico Geological Society spring conference in Socorro

BUDGET

OPERATING BUDGET – Year 2003

FEDERAL FUNDS (October 1, 2002 – September 30, 2003)	
Personnel Services (including salary and benefits for staff)	$186,386.69
Travel (for staff and Federal Working Group members)	26,896.47
Equipment	2,975.32
Communications	160.25
Training	380.00
Registration	250.00
Shipping and mailing	206.39
Operating costs	4,290.50
Contracts and cooperative agreement payments	110,631.00
Moving costs (Director)	8,005.74
TOTAL FEDERAL CONTRIBUTION (46%)	**$340,182.36**
NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY (JULY 1, 2002 - JUNE 30, 2003)	
Personnel Services (including salary and benefits of staff)	$211,920.39
Travel	3,926.06
Operating Costs	23,264.44
Equipment	8,881.95
Approximate Reserves	102,007.16
TOTAL STATE CONTRIBUTION VIA NEW MEXICO TECH	**$350,000.00**
DONATIONS FROM OTHER NON-FEDERAL SOURCES (CALENDAR YEAR 2003)	
Phone service (CEMRC) – in kind	$1,400.00
Office space and administrative/IT support (CEMRC) – in kind	15,000.00
Southwest Region of NSS – Cash donation for library collection	500.00
New Mexico Geological Society – Field Conference Guidebooks (in-kind)	1,700.00
American Geological Institute – 200 copies of *Living with Karst*	3,215.00
Non-federal scientists speaking engagements (in-kind, reimbursements)	2,632.00
Other book donations (in-kind)	2,020.00
Japanese Broadcasting Corporation (cash to NCKRI)	8,218.61
Japanese Broadcasting Corporation (in-kind)	15,840.88
TOTAL	**$50,526.49**
TOTAL NON-FEDERAL CONTRIBUTION (54%)	**$400,526.49**
TOTAL NCKRI OPERATING BUDGET	**$740,708.85**

BUILDING FUND

AS OF 31 DECEMBER 2003

FEDERAL CONTRIBUTION
Fiscal Year 2003 appropriation $1,956,900
TOTAL FEDERAL CONTRIBUTION (45%)
$1,956,900

STATE OF NEW MEXICO CONTRIBUTION
Fiscal Year 2002-2003 appropriation $1,000,000
Fiscal Year 2003-2004 appropriation $340,000

CITY OF CARSLBAD
Pledged in-kind donation of land and infrastructure
$621,220
Cash towards building
$410,000

TOTAL NON-FEDERAL CONTRIBUTION (55%)
$2,371,220

TOTAL BUILDING FUNDS AS OF
31 DECEMBER 2003
$4,328,120

INSTITUTE LEGISLATION

National Cave and Karst Research Institute Act of 1998

S.231

One Hundred Fifth Congress of the United States of America at the second session begun and held at the City of Washington on Tuesday, the twenty-seventh day of January, one thousand nine hundred and ninety-eight. An Act To establish the National Cave and Karst Research Institute in the State of New Mexico, and for other purposes. Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled.

SECTION 1. SHORT TITLE.

This Act may be cited as the 'National Cave and Karst Research Institute Act of 1998'.

SECTION 2. PURPOSES.

The purposes of this Act are—

(1) to further the science of speleology;
(2) to centralize and standardize speleological information;
(3) to foster interdisciplinary cooperation in cave and karst research programs;
(4) to promote public education;
(5) to promote national and international cooperation in protecting the environment for the benefit of cave and karst landforms; and
(6) to promote and develop environmentally sound and sustainable resource management practices.

SECTION 3. ESTABLISHMENT OF THE INSTITUTE.

(a) IN GENERAL- The Secretary of the Interior (referred to in this Act as the 'Secretary'), acting through the Director of the National Park Service, shall establish the National Cave and Karst Research Institute (referred to in this Act as the 'Institute').
(b) PURPOSES- The Institute shall, to the extent practicable, further the purposes of this Act.
(c) LOCATION- The Institute shall be located in the vicinity of Carlsbad Caverns National Park, in the State of New Mexico. The Institute shall not be located inside the boundaries of Carlsbad Caverns National Park.

SECTION 4. ADMINISTRATION OF THE INSTITUTE.

(a) MANAGEMENT- The Institute shall be jointly administered by the National Park Service and a public or private agency, organization, or institution, as determined by the Secretary.
(b) GUIDELINES- The Institute shall be operated and managed in accordance with the study prepared by the National Park Service pursuant to section 203 of the Act entitled 'An Act to conduct certain studies in the State of New Mexico', approved November 15, 1990 (Public Law 101-578; 16 U.S.C. 4310 note).
(c) CONTRACTS AND COOPERATIVE AGREEMENTS- The Secretary may enter into a contract or cooperative agreement with a public or private agency, organization, or institution to carry out this Act.
(d) FACILITY-
(1) LEASING OR ACQUIRING A FACILITY- The Secretary may lease or acquire a facility for the Institute.
(2) CONSTRUCTION OF A FACILITY- If the Secretary determines that a suitable facility is not available for a lease or acquisition under paragraph (1), the Secretary may construct a facility for the Institute.
(e) ACCEPTANCE OF GRANTS AND TRANSFERS- To carry out this Act, the Secretary may accept—
(1) a grant or donation from a private person; or
(2) a transfer of funds from another Federal agency.

SECTION 5. FUNDING.

(a) MATCHING FUNDS- The Secretary may spend only such amount of Federal funds to carry out this Act as is matched by an equal amount of funds from non-Federal sources.
(b) AUTHORIZATION OF APPROPRIATIONS- There are authorized to be appropriated such sums

NATIONAL CAVE AND KARST RESEARCH INSTITUTE

Cave & Karst Studies Program
Earth and Environment Sciences Dept.
New Mexico Institute of Mining and Technology
801 Leroy Place
Socorro, New Mexico 87801 USA

Non-Profit
Socorro, NM
Postage
Permit No. 9